NOAA Teacher at Sea Lesson Plan
Caroline Singler
TAS 2010

Activity Title: Who Studies the Oceans?

Subject (Focus/Topic): Aquatic or Marine Biology/Oceanography/Earth Science

Grade Level: 9th – 12th Grade

Average Learning Time: one week

Lesson Summary (Overview/Purpose)
Students will research marine science careers and prepare poster presentations for a marine science career fair.

Overall Concept (Big Idea/Essential Question)
This activity will introduce students to the wide variety of marine science related careers in an attempt to answer the question "who studies the oceans?" Students will explore the many different ways in which an interest in marine sciences can be used to determine a career path.

Specific Concepts (Key Concepts)
- Marine sciences involve an understanding of many different fields of scientific study.
- Oceanography is an integrated science that incorporates geology, biology, chemistry, physics, environmental science, technology and the social sciences.
- Marine scientists engage in research throughout the world's oceans.
- Marine scientists employ a wide variety of tools and technologies as part of their trade.
- There are no limits to the ways in which a person with an interest in the oceans can apply those interests.
- The future of Earth's oceans depends on the interests, curiosity and passion of today's science students.

Focus Questions (Specific Questions)
- Who studies the oceans?
- What types of jobs do marine scientists do?
- What fields of studies and academic preparation is required to become a marine scientist?
- Where do marine scientists work?
- What are the tools of the trade?

Objectives/Learning Goals
- Students will brainstorm a list of marine science related careers.
- Students will select and research specific careers to learn about what the job entails and the education and job-related training required.

- Students will research specific places, types of jobs and tools of the trade employed by professionals in their chosen careers.
- Students will prepare poster presentations and informational brochures about their chosen careers and present the information at a marine science career fair for younger high school students.

Background Information

The study of marine science involves an understanding of all the sciences and how they relate to the world of water. Marine scientists engage in active research throughout the world's oceans and seas. The diversity of the field attracts scientists from many different specialties – geologists, biologists, chemists, physicists, climatologists, and engineers all actively investigate different aspects of the world's oceans. Humans are not naturally equipped to survive in the oceans, so our study requires special tools and technology to explore the mysteries of the deep.

Listed below are a number of web sites that contain information about different marine careers and/or links to additional references. This is by no means a comprehensive list.
http://www.marinecareers.net/
http://oceanexplorer.noaa.gov/edu/oceanage/welcome.html
http://www.womenoceanographers.org/
http://www.oceancareers.com/2.0/index.php
http://www.noaacorps.noaa.gov/
http://www.uscg.mil/top/careers.asp
http://www.onr.navy.mil/
http://marine.er.usgs.gov/index.php
http://oceanlink.island.net/career/career2.html
http://oceanlink.island.net/career/profiles.html
http://hopkins.stanford.edu/careers.htm
http://www.whoi.edu/
http://marinebio.org/
http://www.marinemammalscience.org/ (click on "for students" then "career advice")
http://ocean.peterbrueggeman.com/career.html
http://www.dolphintrainer.com/career_guide.htm

Common Misconceptions/Preconceptions

- Most students have no idea how many different career paths are available to people with an interest in marine sciences.
- The first thing most students think of when they think of a marine science career is a marine biologist.
- Marine science is only accessible to people who live near an ocean.
- All marine science jobs are academic in origin – if you don't want to teach or work in a university, there's nothing in it for you.

Materials

Lesson Handout entitled "Who Studies the Oceans?"
Various art supplies for poster preparation

Technical Requirements
Computers with Internet access
Color printer

Teacher Preparation
Visit some of the sites listed in the Background Information section to become familiar with the wide variety of marine science careers. If you only have time for one site, check out http://oceanexplorer.noaa.gov/edu/oceanage/welcome.html

Take a look at the teacher logs from past field seasons on the NOAA Teacher at Sea web site (http://teacheratsea.noaa.gov/). Teachers in the program participate in research cruises on a wide variety of missions. Their logs are a good way to see what marine scientists do in the "real world".

It might be helpful to prepare a power point presentation of images of marine scientists at work, focusing especially on some of the lesser-known and more unusual professional applications of marine science.

Arrange in advance to hold the "career fair" in a classroom or conference room. If there is a secure location, you can set it up so that different classes of students can visit at different times during the school day, even when the presenters are attending other classes, or arrange an in-school field trip for the presenters so that they are available throughout the day to answer questions for visitors. Invite other teachers, administrators, and parents, as appropriate.

Keywords: marine science careers

Lesson Procedure
1. Begin with a brainstorming session. Have students list any jobs or fields of study that they associate with marine science. If necessary, show the class images of marine scientists at work.
2. Talk about the different areas of science and other fields of interest in which marine professionals specialize and the wide variety of skills they employ.
3. This project should be done in small groups with most work occurring during class time. Allow about a week of class time for groups to research and prepare their work products. Develop a timeline with the class on the first day of the project so that students budget their time efficiently. Emphasize that students should spend at least one full class period doing research into their selected careers. Encourage students to go beyond the superficial aspects of the job and to look for specific examples of people doing that job. Their goal is to prepare a presentation that is engaging and informative to other students. They should try to find a variety of images to illustrate the different aspects of the careers. Remind students to document all references used.
4. Students will present their posters to the class as a trial run for the career fair. Have classmates evaluate each other's posters and ask questions about the careers presented. Encourage students to add information as needed to answer their classmates' questions.
5. Hold the career fair in a classroom or conference room where students' posters can be displayed with plenty of room for visitors to circulate and talk to presenters.

Assessment and Evaluation
This project was designed as the final project for a semester long Aquatic Biology course but it would also work well as an introductory activity at the beginning of a course. Assess student learning based on the quality of their posters and informational brochures and their ability to answer questions about their presentation. Each group will present a number of careers equal to the number of students in the group. Posters and brochures should address the questions outlined in Step Two of the instructions on the Who Studies the Oceans? Handout. Assess students based on the clarity and completeness of the information presented. Emphasis should be placed on the documentation of sources of information and images used on the poster and in the brochure. A simple rubric may also be used to ask visitors to the career fair to rate the clarity of student presentations and degree to which they achieved the project objectives.

Standards

- **National Science Education Standards Addressed**
  - A: Science as Inquiry
    - A.1 Abilities to do scientific inquiry
    - A.2 Understandings about scientific inquiry
  - E: Science and Technology
    - E.2 Understandings about science and technology
  - F: Science in Personal and Social Perspectives
    - F.6 Science and technology in local, national, and global challenges
  - G: History and Nature of Science
    - G.1 Science as a human endeavor
    - G.3 Historical perspectives

- **Ocean Literacy Principles Addressed**
  Principle 6. The ocean and humans are inextricably interconnected.

  Principle 7. The ocean is largely unexplored.

Additional Resources
See list of references in Background Information

Author: Caroline Singler, Lincoln-Sudbury Regional High School, 390 Lincoln Road, Sudbury MA 01776, caroline_singler@lsrhs.net

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Who Studies the Oceans? **Aquatic Biology Midyear Project 2010-11**

The study of Marine Science involves an understanding of all the sciences and how they relate to the world of water. Marine scientists engage in active research throughout the world's oceans and seas. The diversity of the field attracts scientists from many different specialties – geologists, biologists, chemists, physicists, climatologists, and engineers all actively investigate different aspects of the world's oceans. Humans are not naturally equipped to survive in the oceans, so our study requires special tools and technology to explore the mysteries of the deep.

You will work with a team of three people to learn more about marine science careers and the people who investigate the world's oceans.

Step One – Brainstorm

Compile a list of marine science careers. Start with whatever first comes to mind, and then do some research with the help of some of the web sites listed below. These are just a few of the many sites found in a simple search for "marine science careers". Use these sites or conduct your own search. There is no shortage of available information. Visit at least four or five different sites – you might be surprised to learn all the different types of careers that are available to a person interested in the ocean.

http://www.marinecareers.net/
http://oceanexplorer.noaa.gov/edu/oceanage/welcome.html
http://www.womenoceanographers.org/
http://www.oceancareers.com/2.0/index.php
http://www.noaacorps.noaa.gov/
http://www.uscg.mil/top/careers.asp
http://www.onr.navy.mil/
http://marine.er.usgs.gov/index.php
http://oceanlink.island.net/career/career2.html
http://oceanlink.island.net/career/profiles.html
http://hopkins.stanford.edu/careers.htm
http://www.whoi.edu/
http://marinebio.org/
http://www.marinemammalscience.org/ (click on "for students" then "career advice")
http://ocean.peterbrueggeman.com/career.html
http://www.dolphintrainer.com/career_guide.htm

Keep a list of ALL sites that you visit so you can find them again later.

Step Two – Choose and Research Careers

Each team member will select a marine science career of particular interest to you. Select careers from different fields of science – in other words, do not do all choose marine biology careers, or at least select a variety of biology careers. Choose careers that interest you, about which you are eager to learn and that you will be excited to share with other people. Consider traditional careers as well as those that are on the "cutting edge" of marine science. Conduct research to answer the following questions so that you can prepare a profile for each career.

1. What does the job entail? What types of things does this person study? Why is this an important field of study?
2. What type of education and job-related training does the job require? Note that some jobs require 4-year degrees, some require advanced degrees, and some may not need a college degree but require specific training and expertise.
3. Who employs you? Will you work for a government agency (local, state, or federal), be a member of a branch of the U.S. military, work in a university or for a research institution, work for private industry, school, aquarium, etc.? Where do you work – school, office, laboratory, at sea?
4. What are the "tools of the trade"? Marine science technologies are constantly evolving, and there are exciting new instruments being introduced and employed all the time. Then again, there is a lot that can be done with simple tools like cameras and binoculars.
5. Where – literally and figuratively – can this career take you? Look for examples of people who have this career and identify specific places where they work.

Prepare a list of all references used for your research.

Step Three – Presentation of Information

This step includes the creation of two work products. Your team will prepare (a) a poster display about the careers that will be presented at a "Marine Science Career Fair" for the 9th grade Earth Science classes, and (b) an informational brochure or fact sheet that can be handed out to students who are interested in learning more about your featured careers.

Be creative. Make your poster visually appealing. Be neat, interesting and accurate. Use color images of professionals at work and the tools of their trade. Look for clear, simple graphics that illustrate the most important information about the career. Be sure to document the source of each image you use. Keep the written text on the poster to a minimum – use bullet lists and word splashes together with images to convey information. Your goal is to capture the attention of a passing student so that he/she will stop and hear more about it from you. Summarize the key points of the career in the brochure or fact sheet, including a couple of good reference sites that the student can use to learn more.

You have four days (one week) of class time to work on the project. Computers and art supplies are available in the classroom for your use. We will conduct a trial run of the poster presentations in class. Hand in a clean original of the brochure/fact sheet that can be copied for the career fair.

Remember: you will rely primarily on the Internet for information. Please note that Wikipedia is not a bad place to get basic introductory information about a topic, but it cannot be your only source. And sites like Google are search engines that will help you find information, NOT references. Keep a list of ALL sites that you use for information and graphics AND include the reference list on your poster.